

The Role of Vocabulary in the HL7 Version 3 Modeling Process

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Goals

- Overview of HL7 and the Version 3 Message Development Process
- The Role of Vocabulary in the HL7 Reference Information Model (RIM)
- The HL7 Vocabulary Model
- Common Terminology Services

Health Level Seven



- Health Level Seven (HL7) is an American National Standards Institute (ANSI) Accredited Standards Developer.
- The (current) mission of HL7 is to provide a comprehensive framework and related standards for the exchange, integration, storage, and retrieval of health information that support clinical practices and the management, delivery and evaluation of health services.

Health Level Seven

- Founded in 1987 to develop an open standard for vendors to use to interface clinical systems
- First widely implemented standard was Version 2.1, published in March 1990
- Today, more than 90% of hospitals in the United States use one or more versions of the HL7 V2.x

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Why Version 3?

Why Version 3? Pluses and Minuses of V2.x

Pluses

- broad functional coverage
- highly adaptable
 - IS environments differ
 - system capabilities variations
- vocabulary independent
- *least common denominator* technological base

Minuses

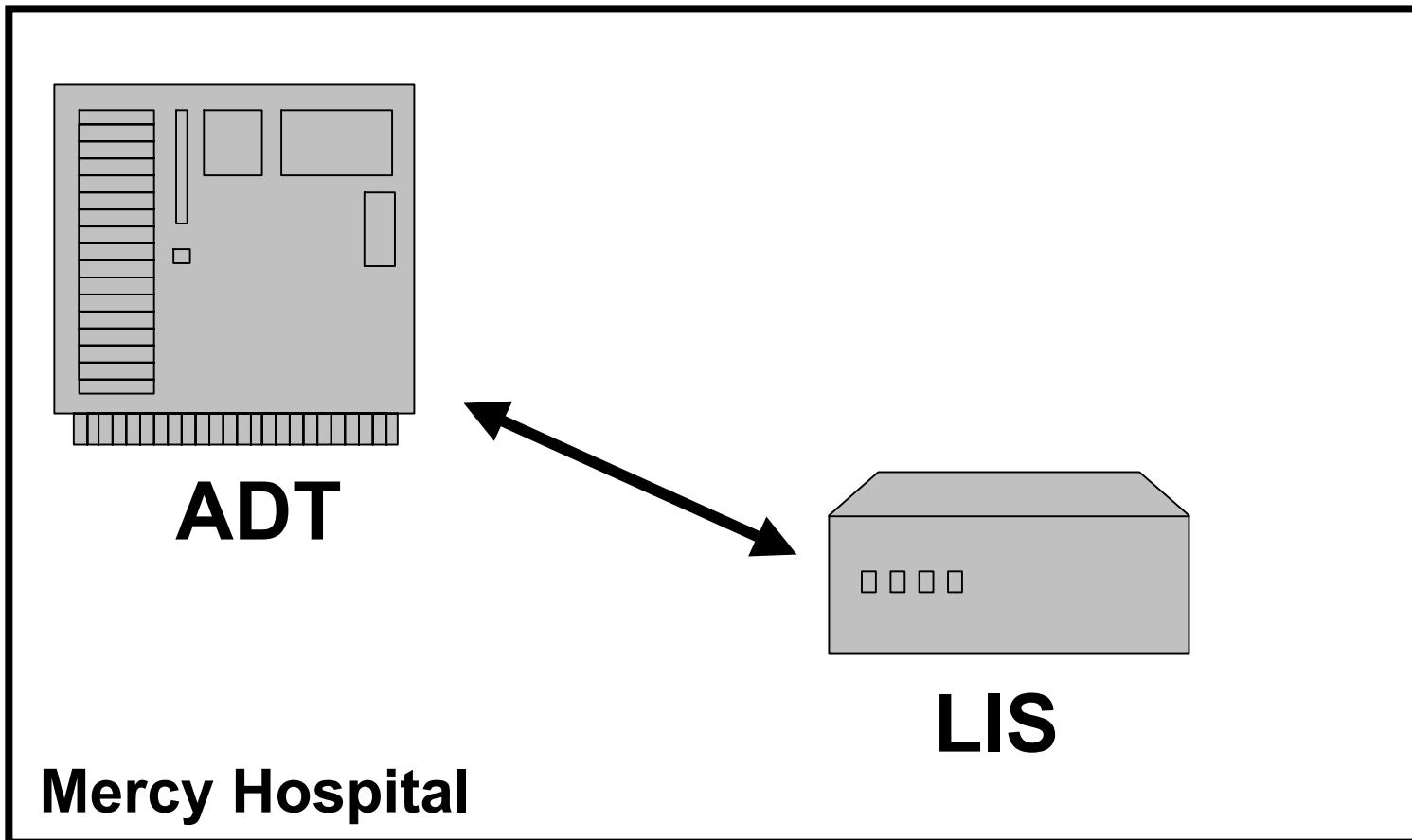
- broad functional coverage
- highly adaptable
 - “Seen one? Seen one.”
 - vendor capability mismatch
- vocabulary independent
- *least common denominator* technological base

Why Version 3? Evolution of the HL7 Mission

- **Version 2.0**

The purpose of HL7 is to develop and publish protocol specifications for application level communication among diverse health data acquisition, processing and handling systems.

Version 2.0 Individual Systems

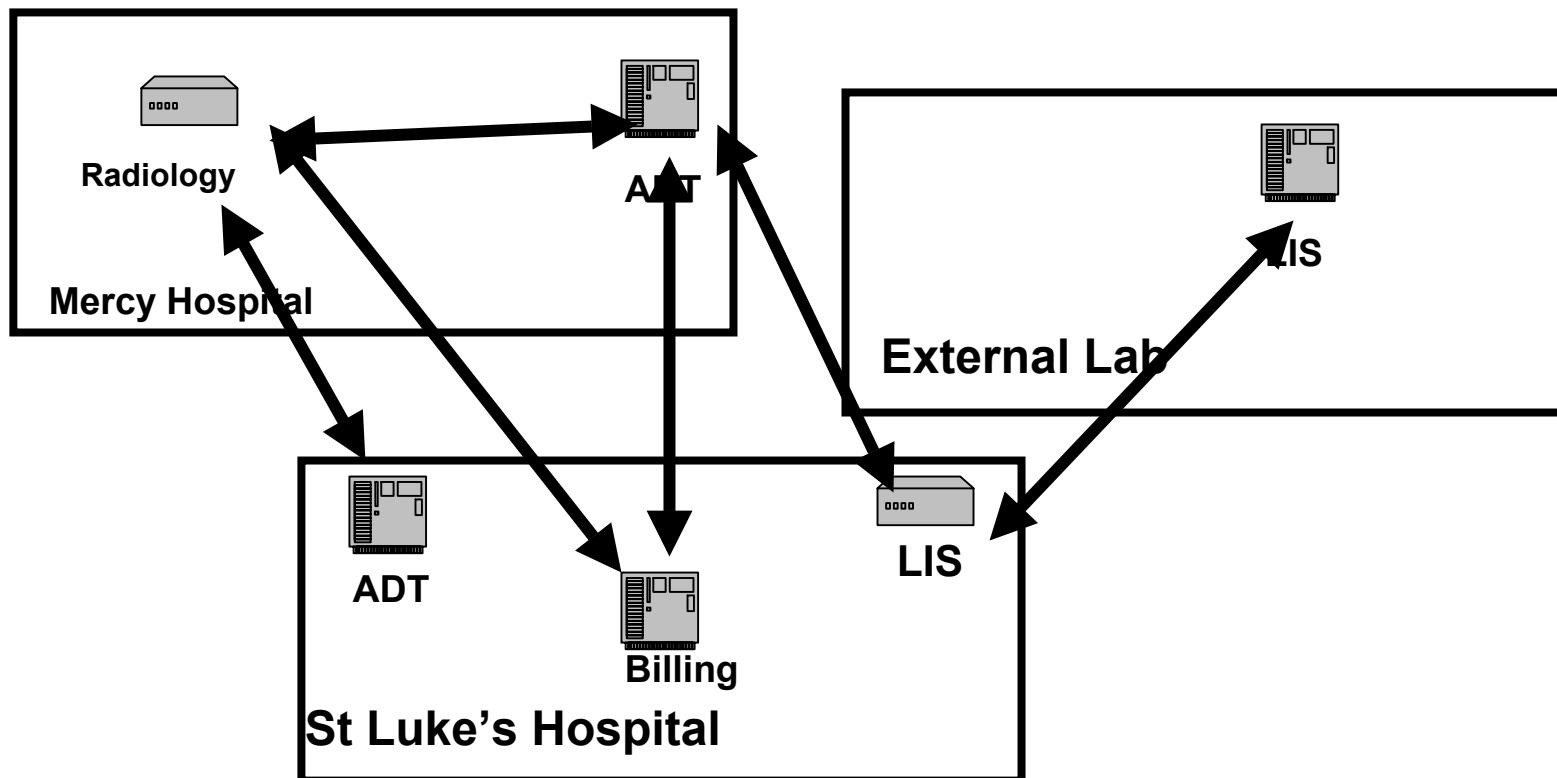


Why Version 3? Evolution of the HL7 Mission

- **Version 2.x (1997)**

To provide standards for the exchange, management and integration of data that support clinical patient care and the management, delivery and evaluation of healthcare services. Specifically, to create flexible, cost effective approaches, standards, guidelines, methodologies, and related services for interoperability between healthcare information systems.

Version 2.x Institutions



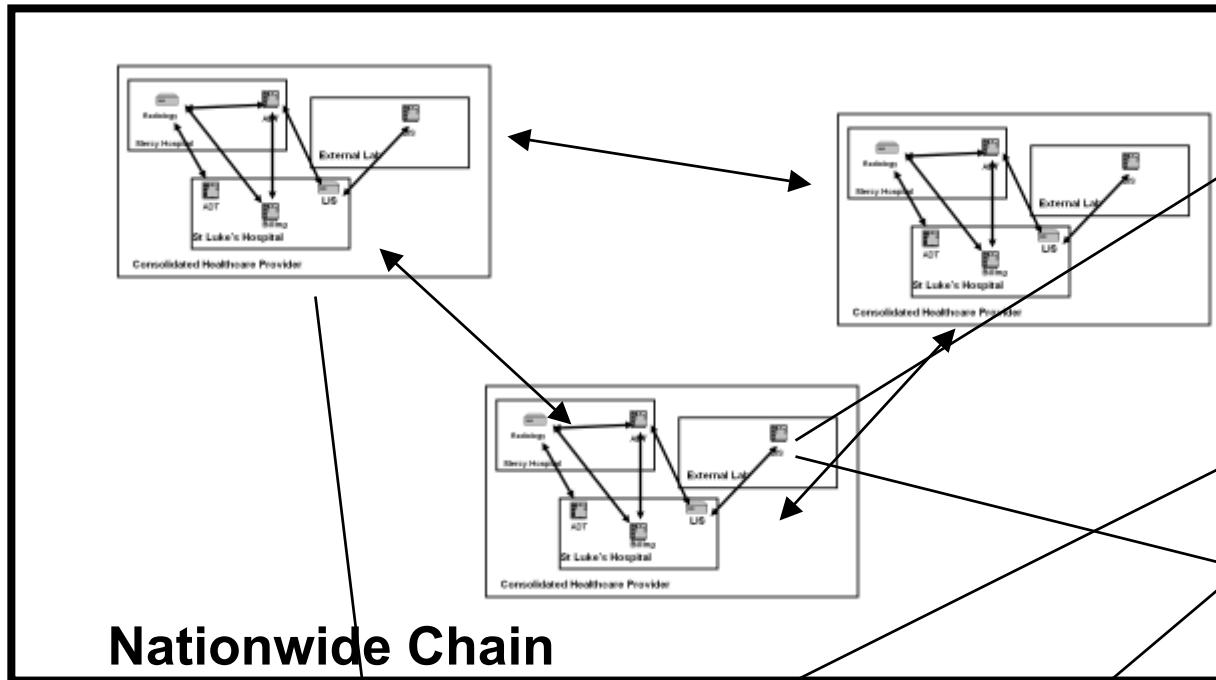
Consolidated Healthcare Provider

Why Version 3? Evolution of the HL7 Mission

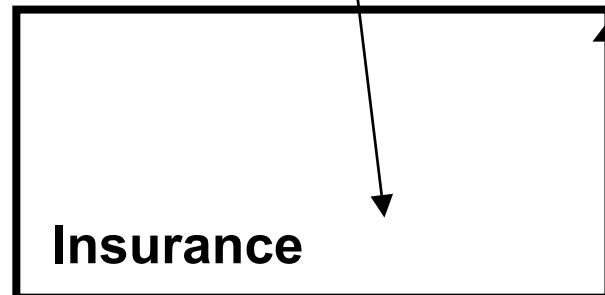
- **Today**

To provide a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services. Specifically, to create flexible, cost effective standards, guidelines, and methodologies to enable healthcare information system interoperability and **sharing** of electronic health records.

Version 3



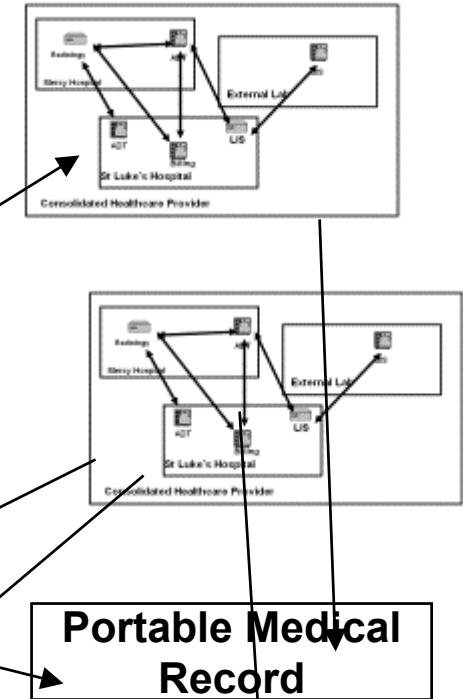
Nationwide Chain



Insurance



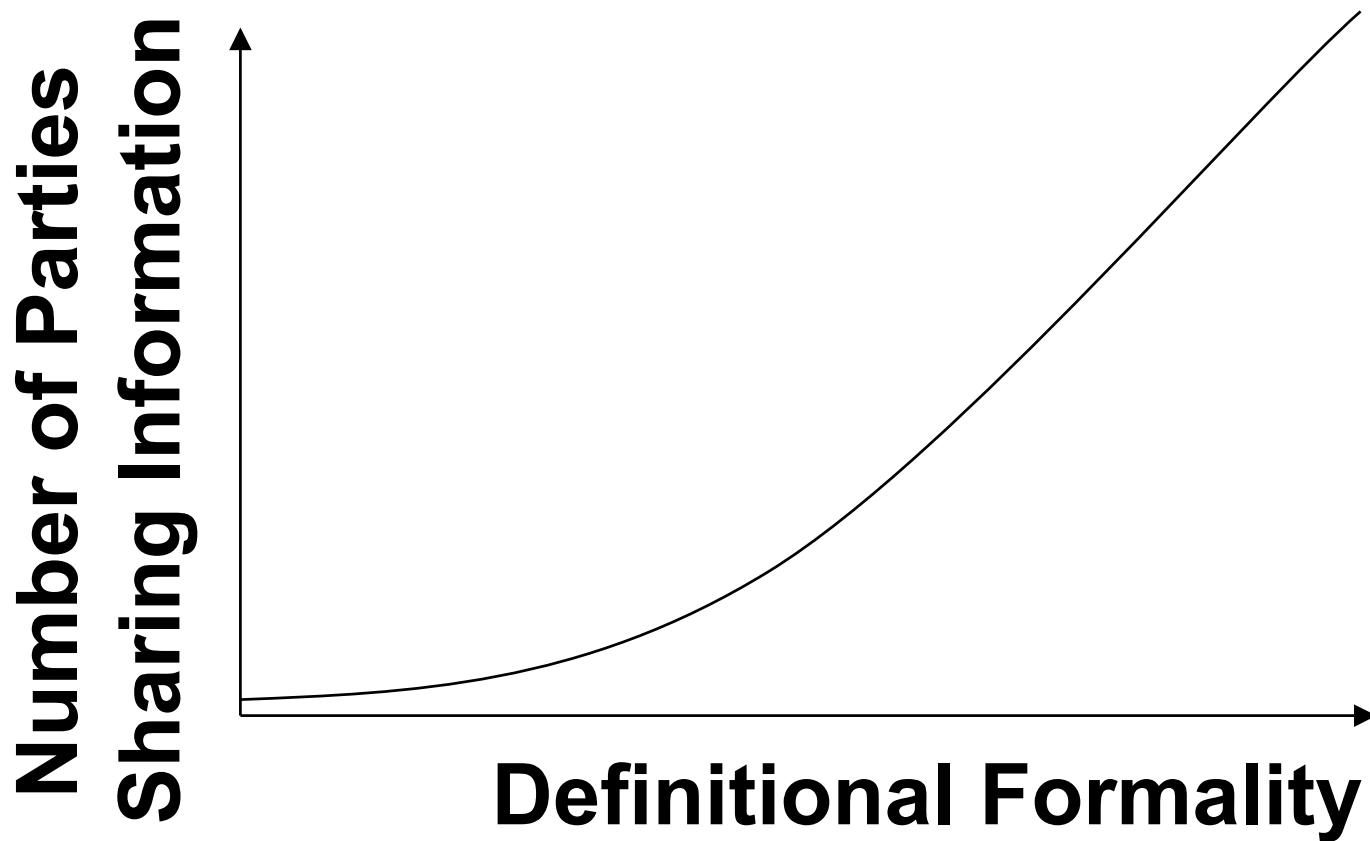
CDC & Federal



Portable Medical
Record

Biomedical
Research

Modeling Structure and Formalism



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Version 3 Methodology

The HL7 Message Development Framework

Phases, activities, and models

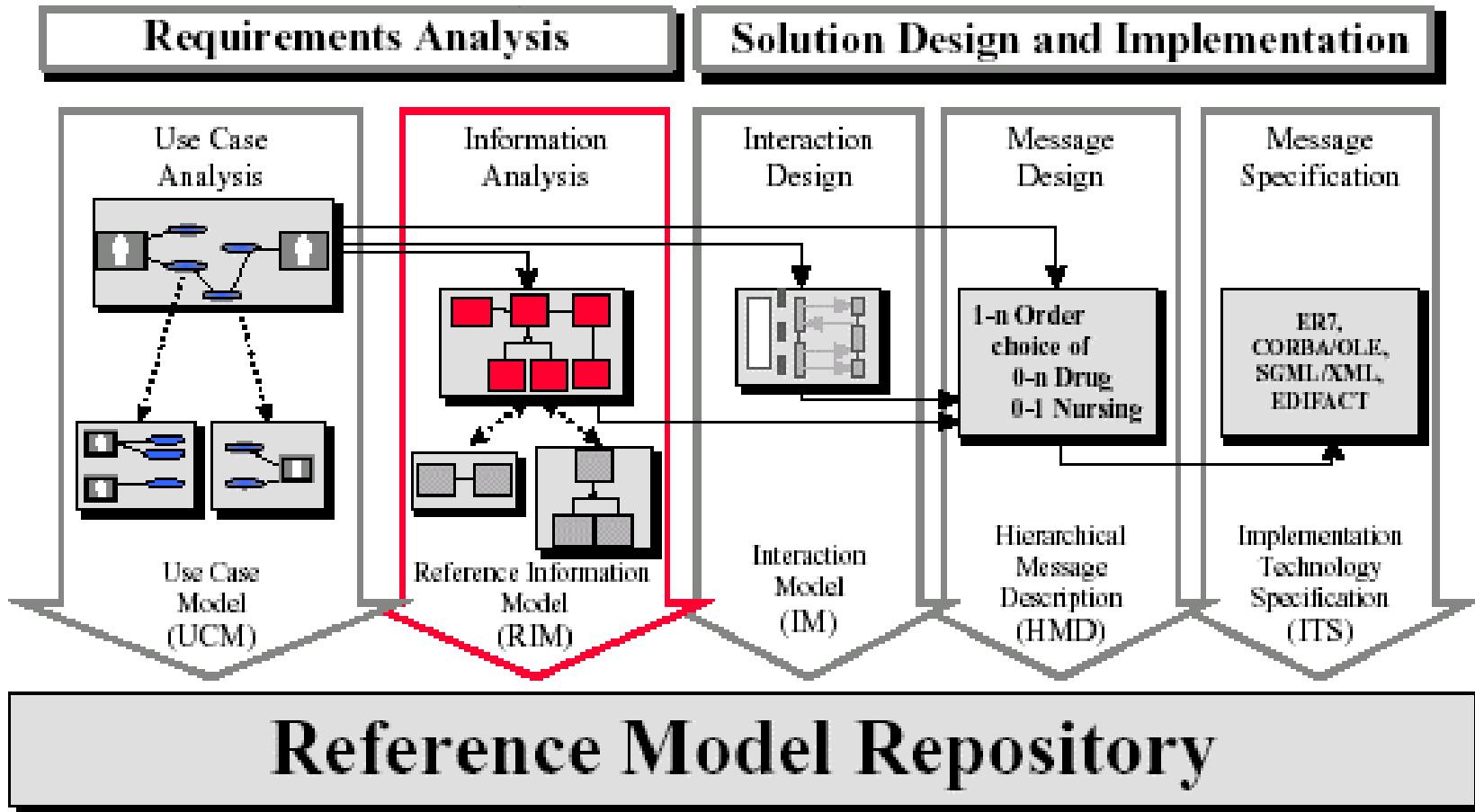
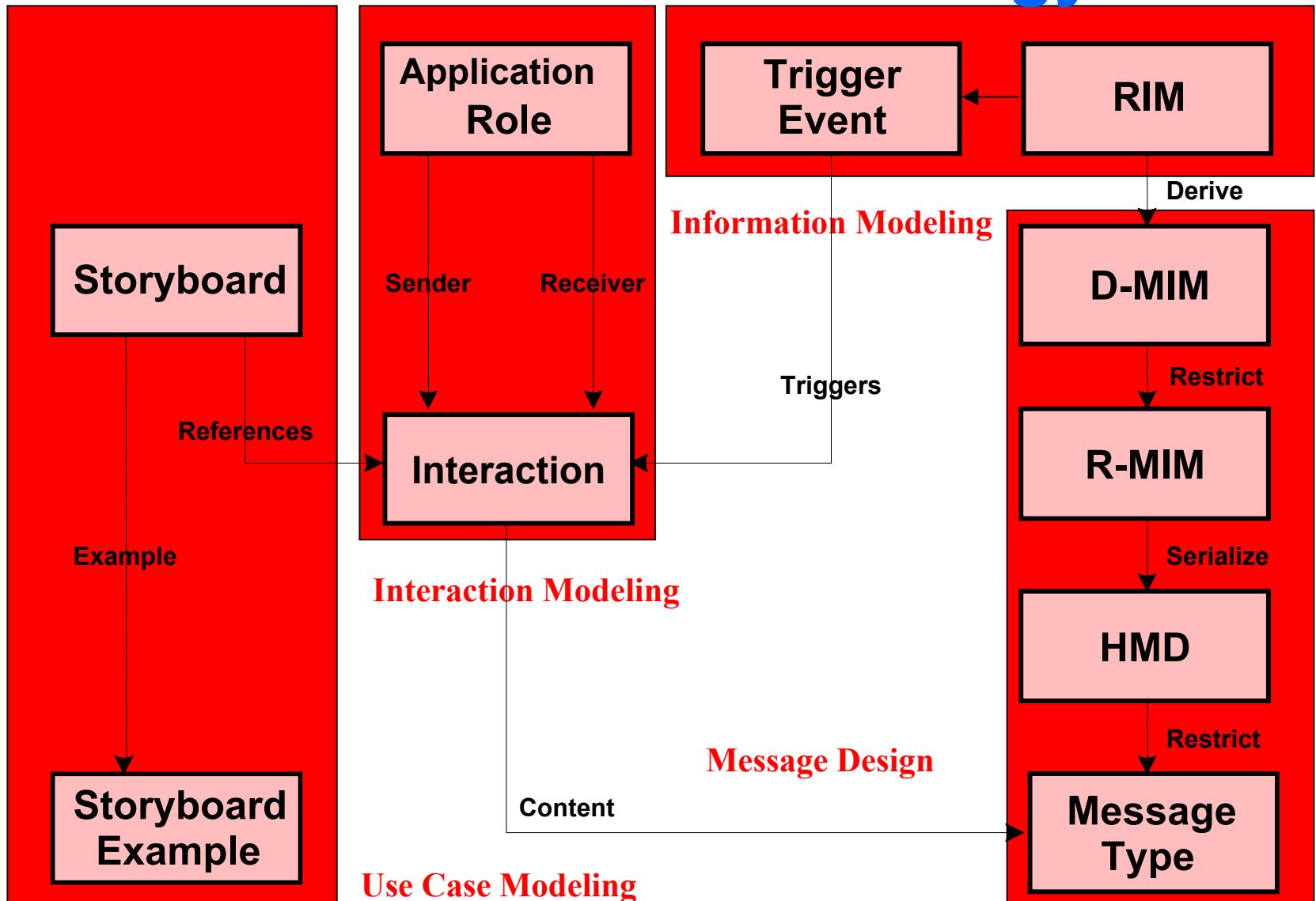
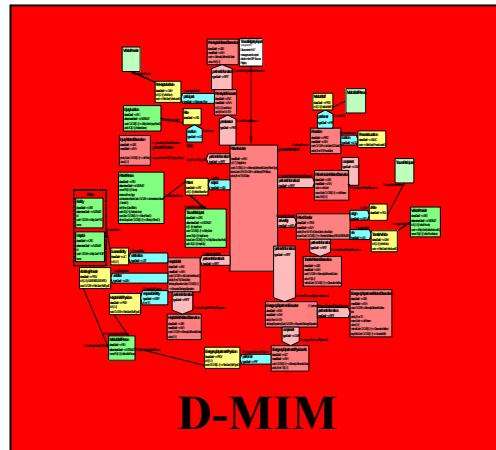
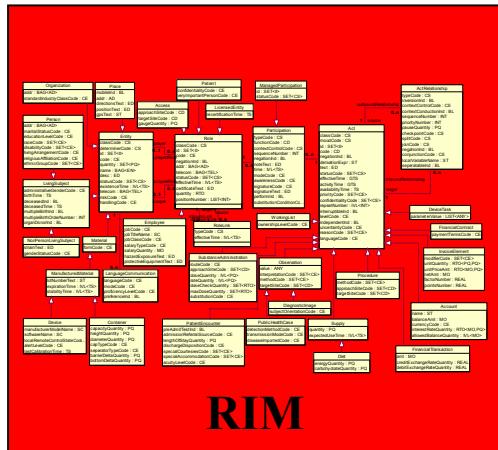


Figure 1-2. HL7 Message Development Process Model

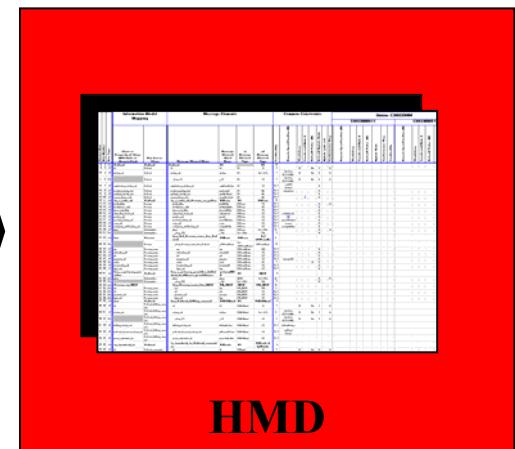
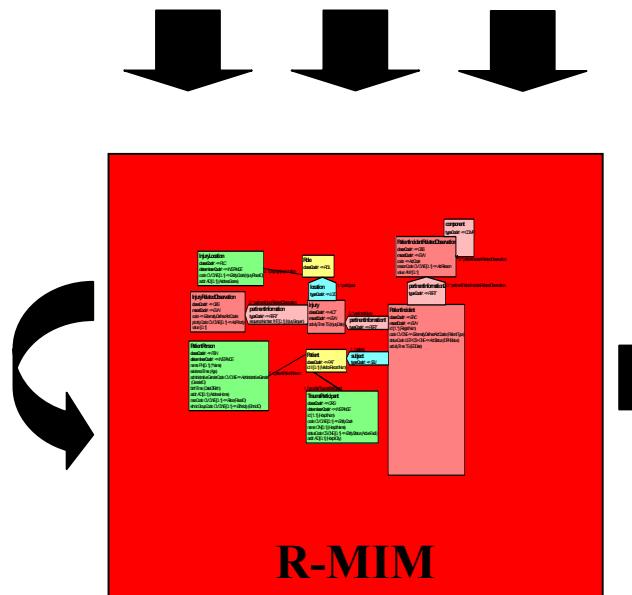
Version 3 Methodology



HL7 V3 Message Design Models



↓ ↓ ↓



Hierarchical Message Definition

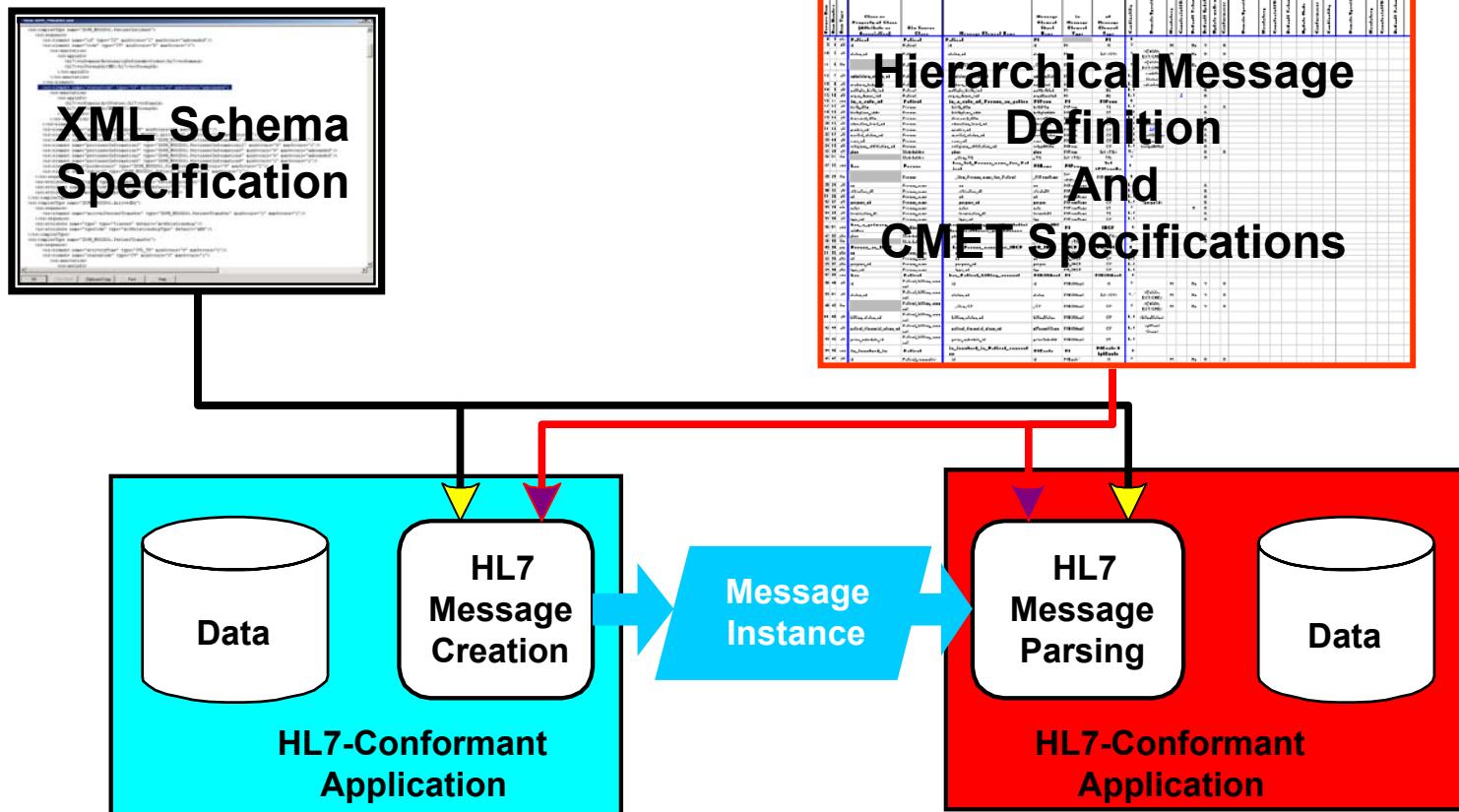
Information Model Mapping

Message Element Specifications

Common Constraints

Message Type Specification(S)

HL7 V3 Message Implementation Technology



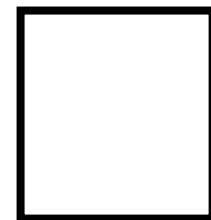
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**The HL7 Reference
Information Model**



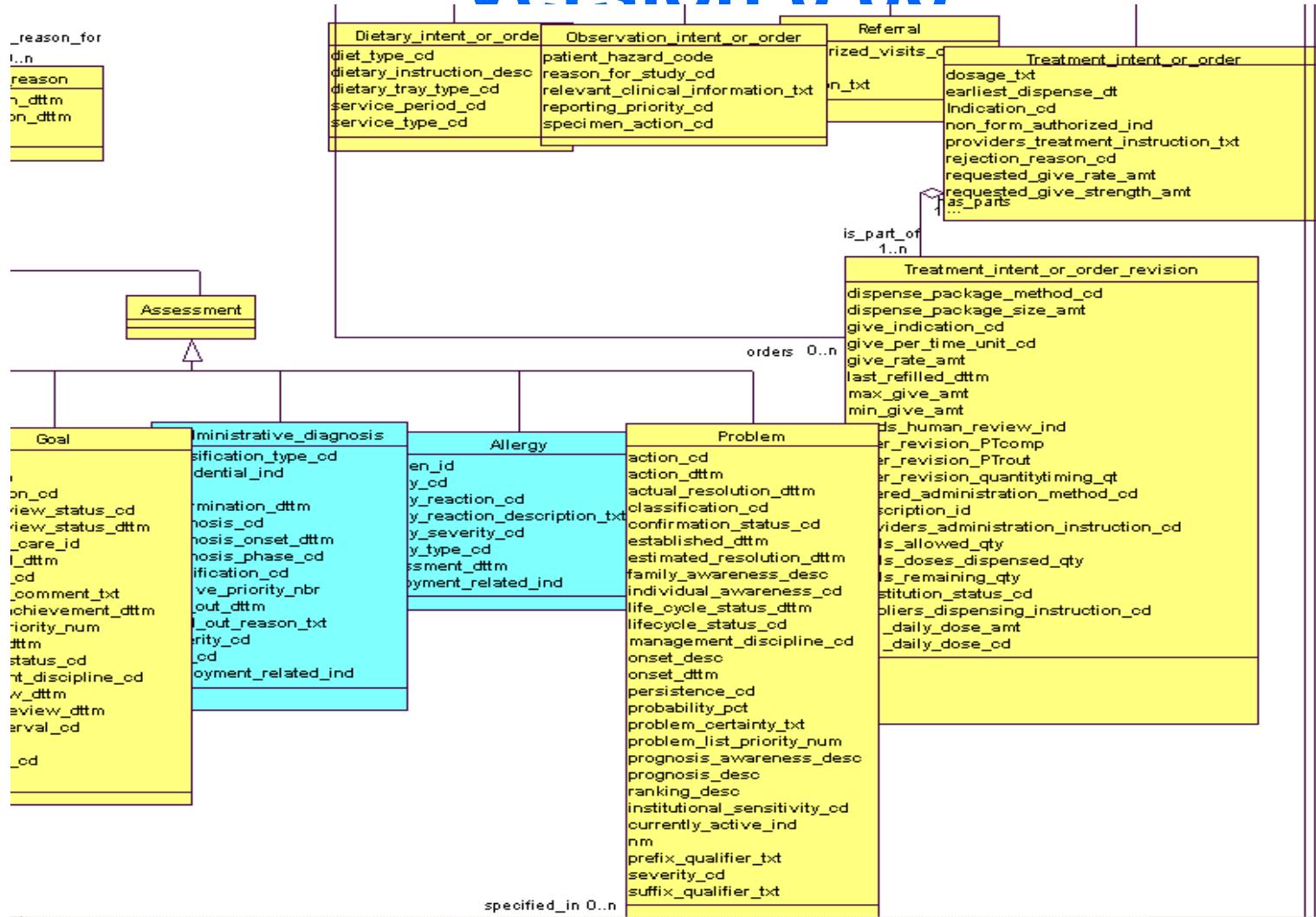
Reference Information Model

Version 0.86

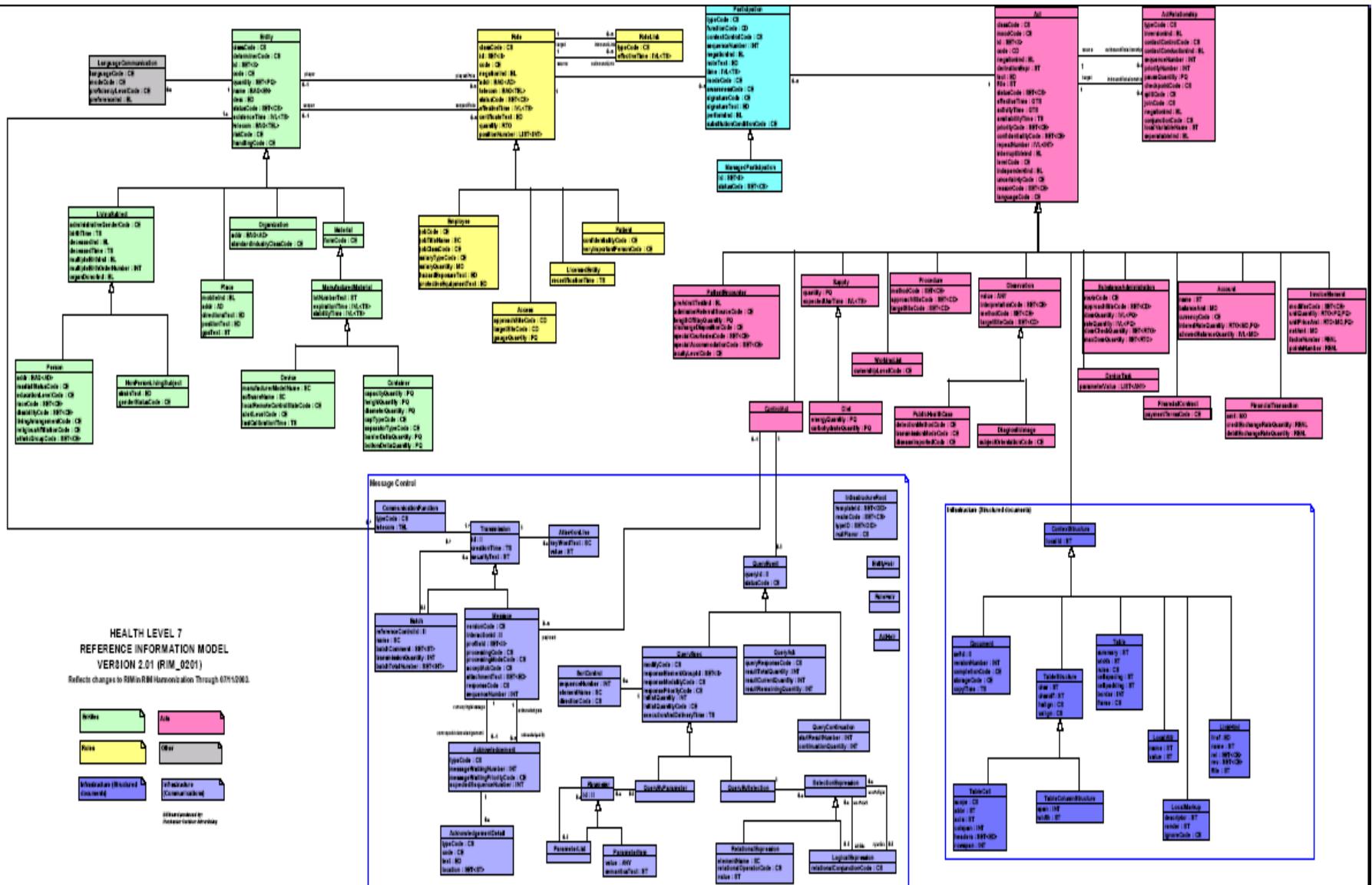


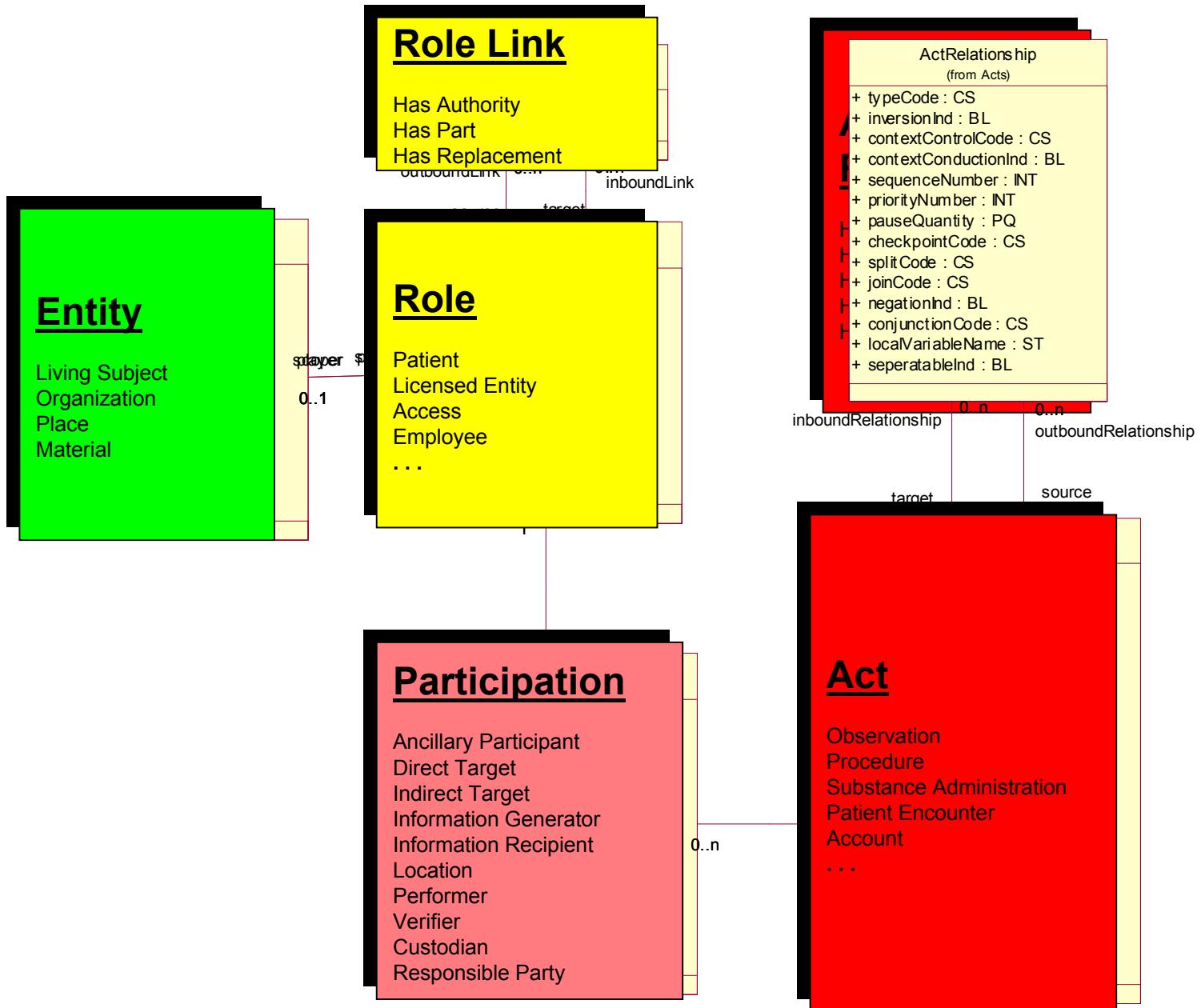
Reference Information Model

Version 0.86

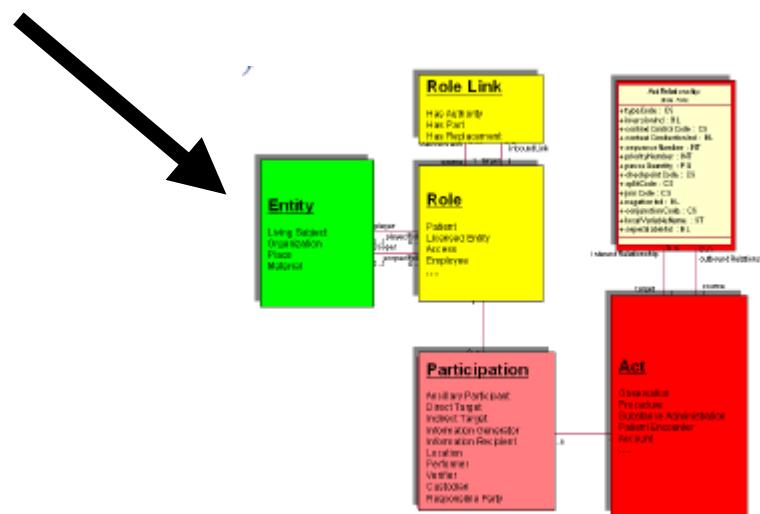


HL7 Rim V2.01





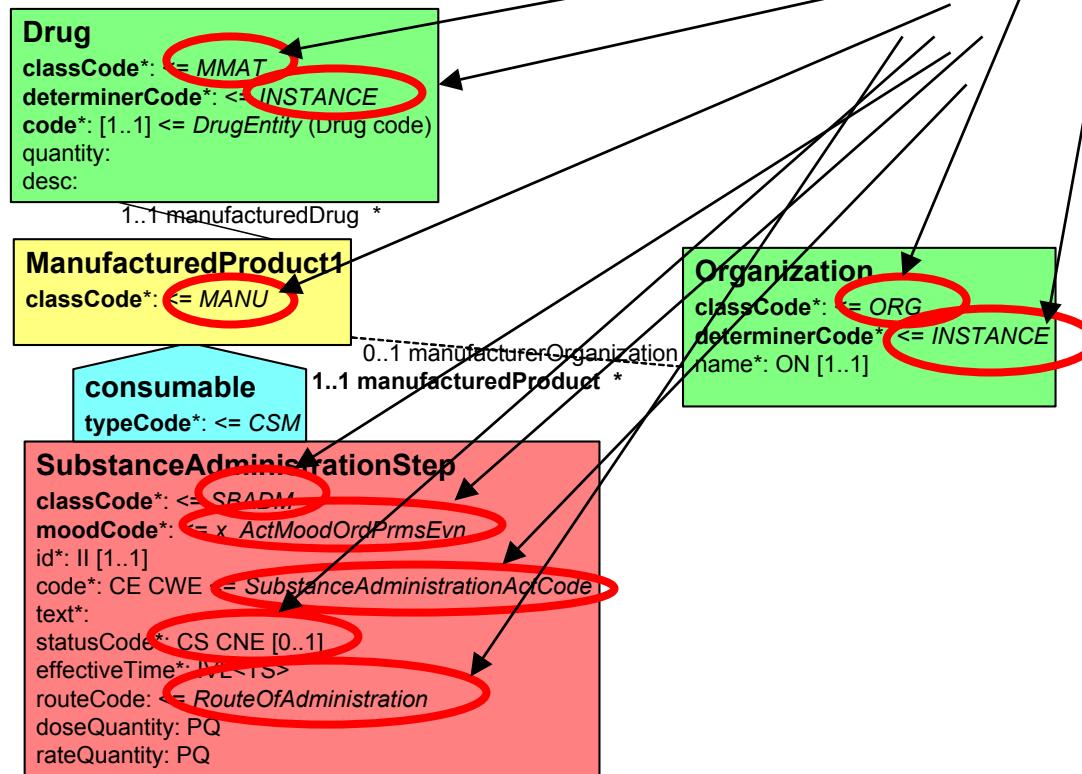
Post 0.86 Rim Where Did the Complexity Go?



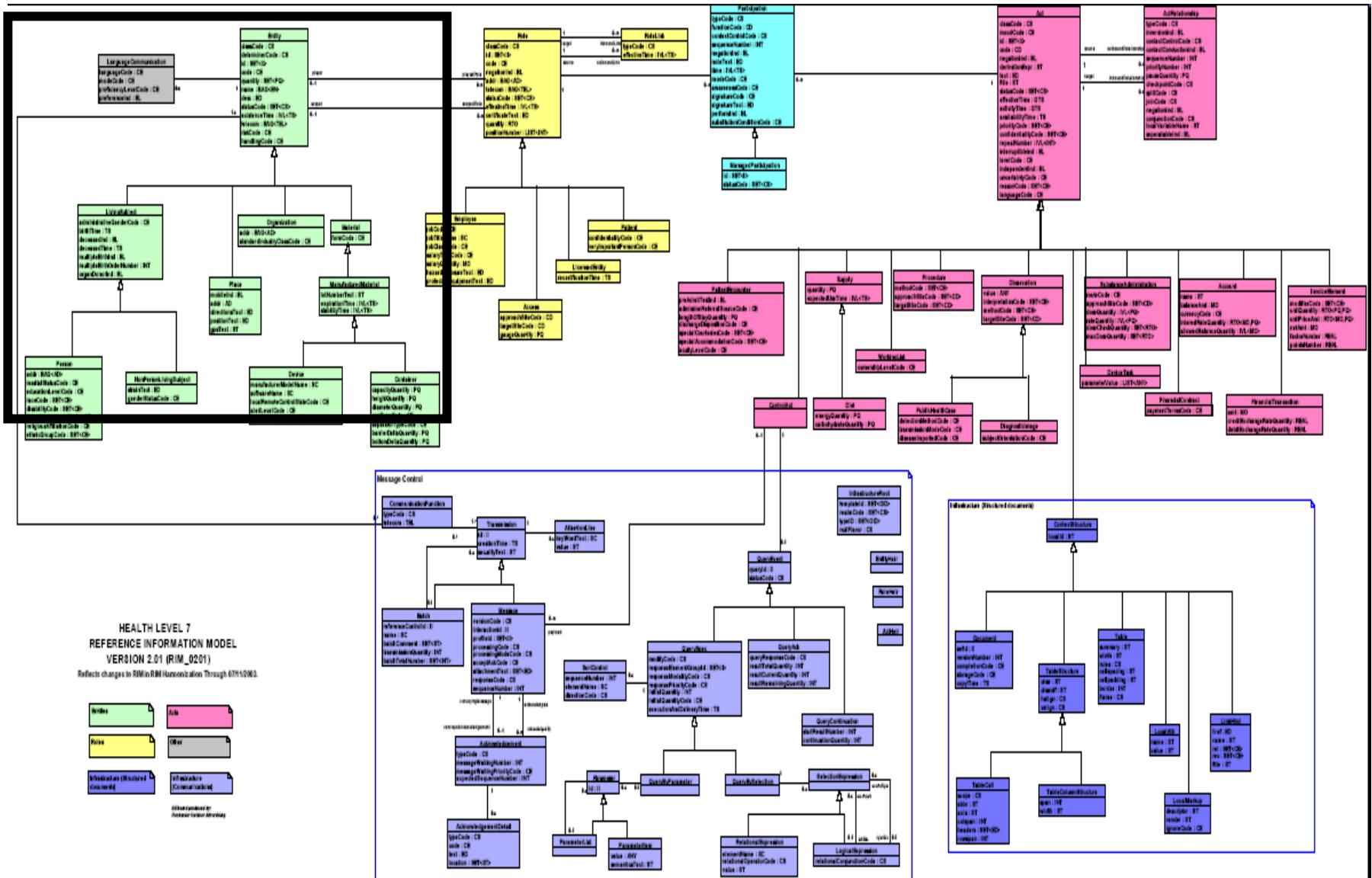
+ Vocabulary

Statements in “RIMese”

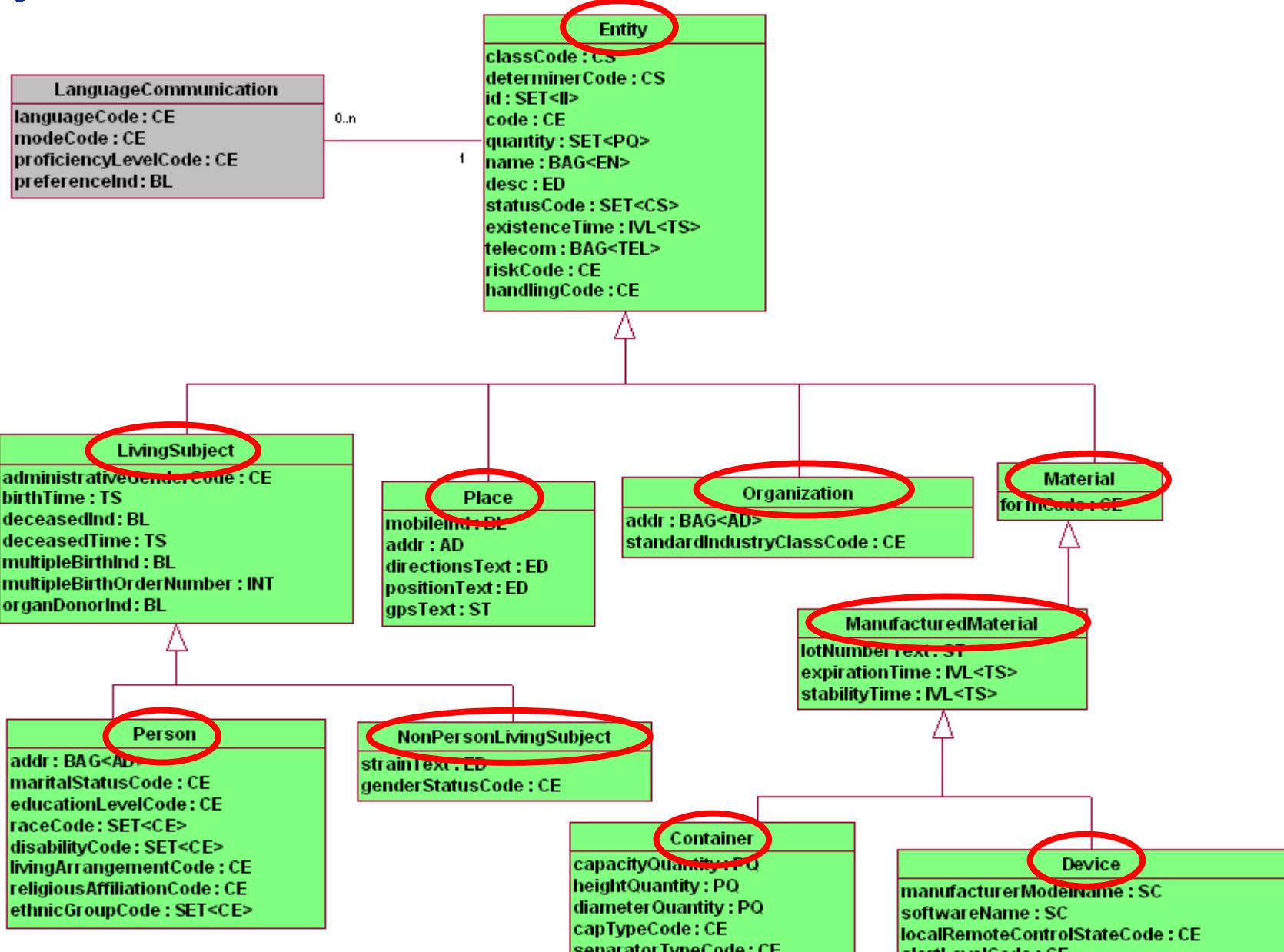
Vocabulary



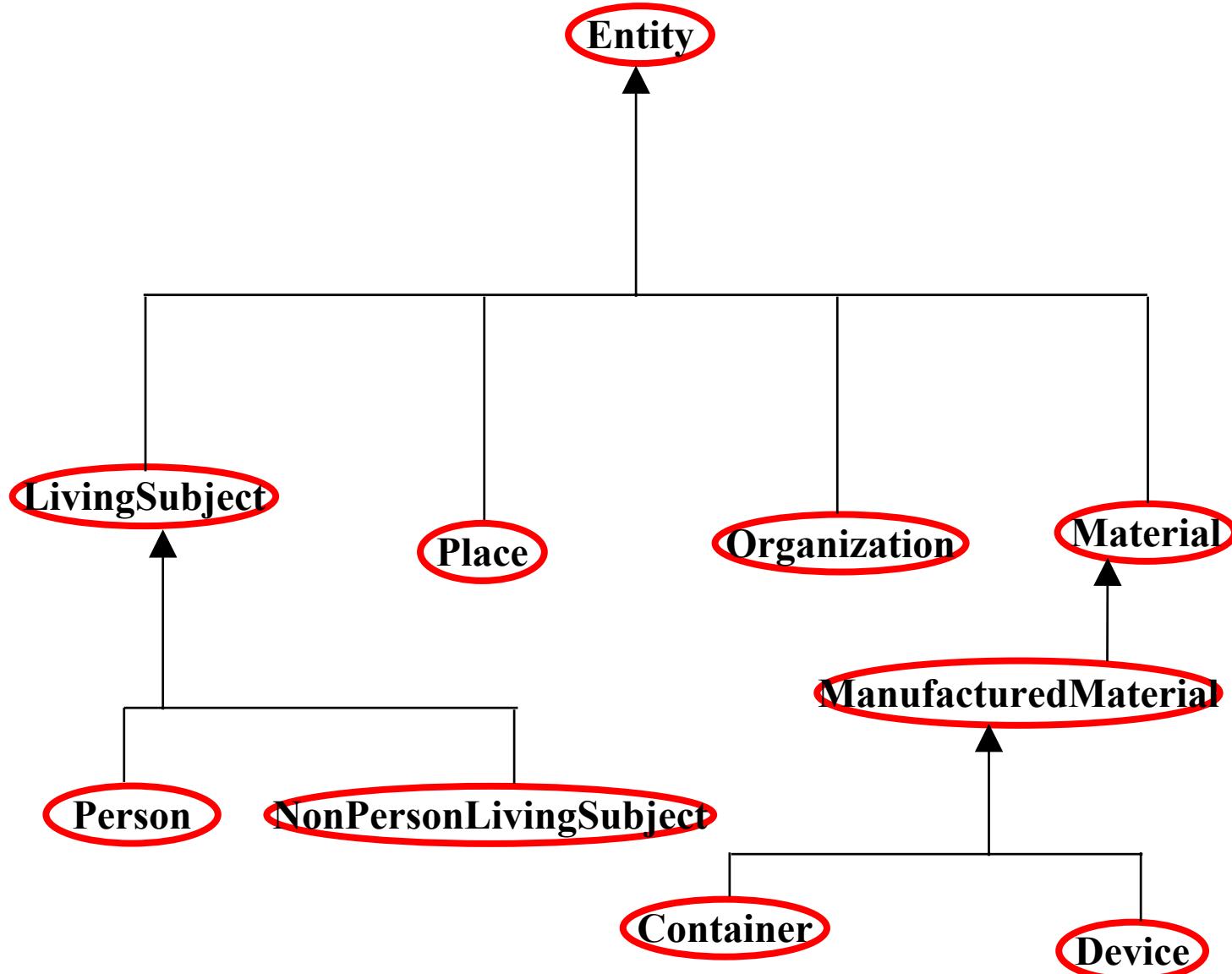
HL7 Rim V2.01



Structural Codes – The Information Model



Structural Codes – The Information Model



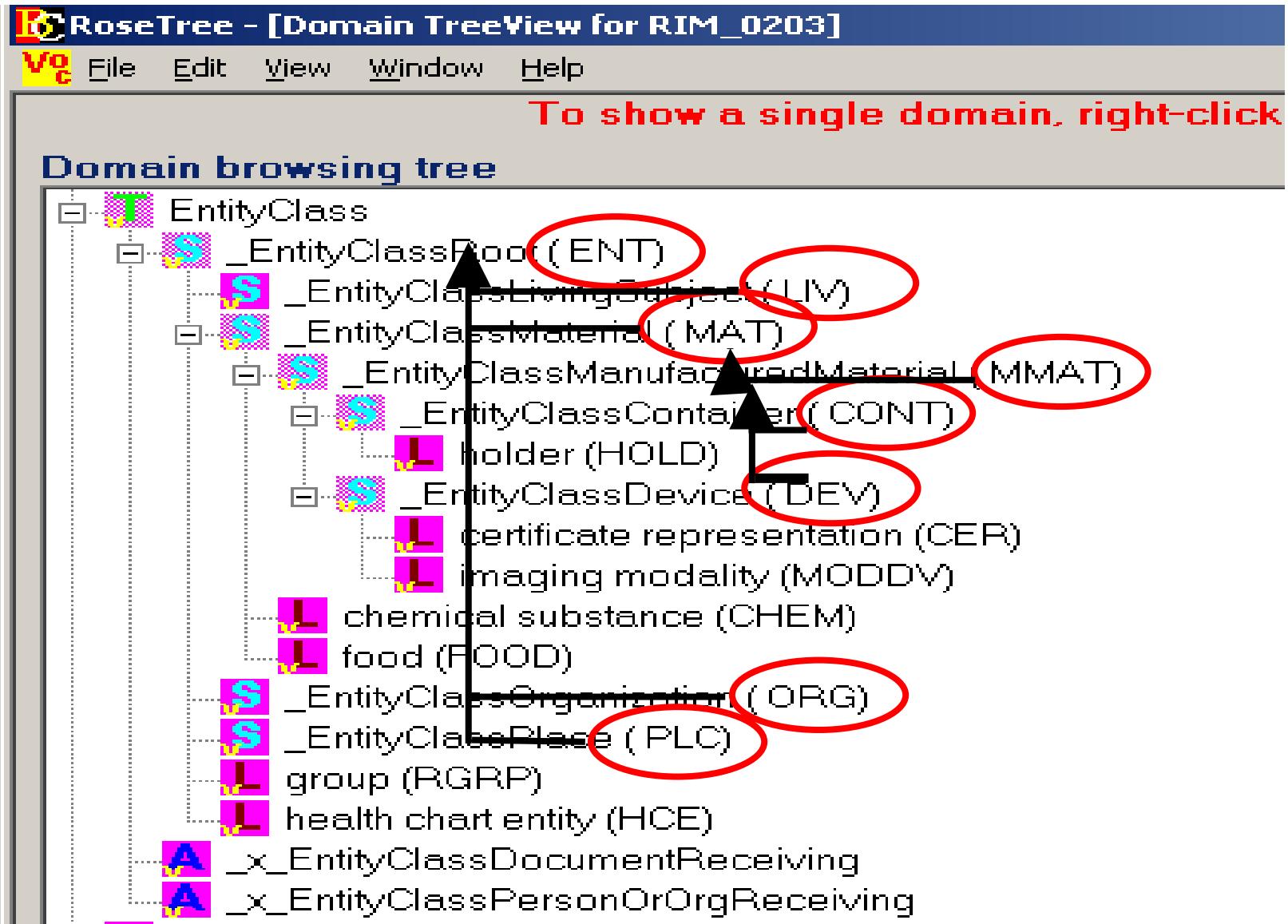
RoseTree - [Domain TreeView for RIM_0203]

File Edit View Window Help

To show a single domain, right-click

Domain browsing tree

- EntityClass
 - _EntityClassRoot (ENT)
 - _EntityClassLivingSubject (LIV)
 - _EntityClassMaterial (MAT)
 - _EntityClassManufacturedMaterial (MMAT)
 - _EntityClassContainer (CONT)
 - holder (HOLD)
 - _EntityClassDevice (DEV)
 - certificate representation (CER)
 - imaging modality (MODDV)
 - chemical substance (CHEM)
 - food (FOOD)
 - _EntityClassOrganization (ORG)
 - _EntityClassPlace (PLC)
 - group (RGPR)
 - health chart entity (HCE)
 - _x_EntityClassDocumentReceiving
 - _x_EntityClassPersonOrOrgReceiving



RoseTree - [Domain TreeView for RIM_0203]

Voc File Edit View Window Help

To show a single domain, right-click or

Domain browsing tree

- EntityCode
 - A _MaterialEntityClassType
 - A _ContainerEntityType
 - S _PackageEntityType (PKG)
 - S _CompliancePackageEntityType (COMPPKG)
 - S _KitEntityType (KIT)
 - A _NonRigidContainerEntityType
 - A _RigidContainerEntityType
 - A _DrugEntity
 - A _MaterialEntityAdditive
 - A _MedicalDevice
 - A _AccessMedicalDevice
 - A _AdministrationMedicalDevice
 - A _ProductEntityType
 - A _SpecimenEntityType
 - A _x_AdministeredSubstance
 - L Blood Product (BLDPRD)
 - L Vaccine (VCCNE)
 - A _PlaceEntityType

RoseTree - [Domain TreeView for RIM_0203]

Voc File Edit View Window Help

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Domain browsing tree

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RoseTree - [Domain TreeView for RIM_0203]

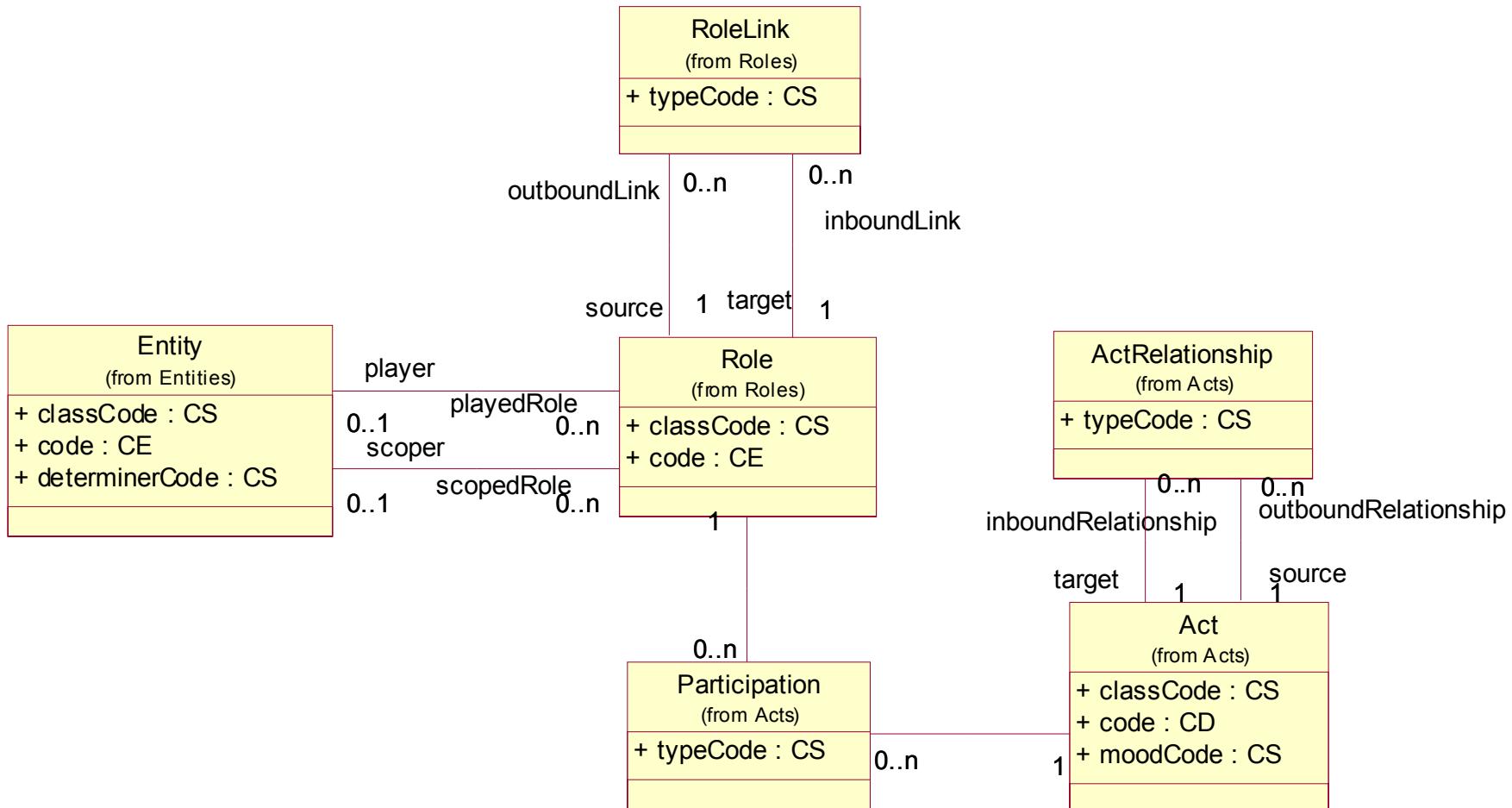
Voc File Edit View Window Help

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 - _RigidContainerEntityType
 - _DrugEntity
 - _MaterialEntityAdditive
 - _MedicalDevice
 - _AccessMedicalDevice
 - _AdministrationMedicalDevice
 - _ProductEntityType
 - _SpecimenEntityType
 - _x_AdministeredSubstance
 - Blood Product (BLDPRD)
 - Vaccine (VCCNE)
 - _PlaceEntityType

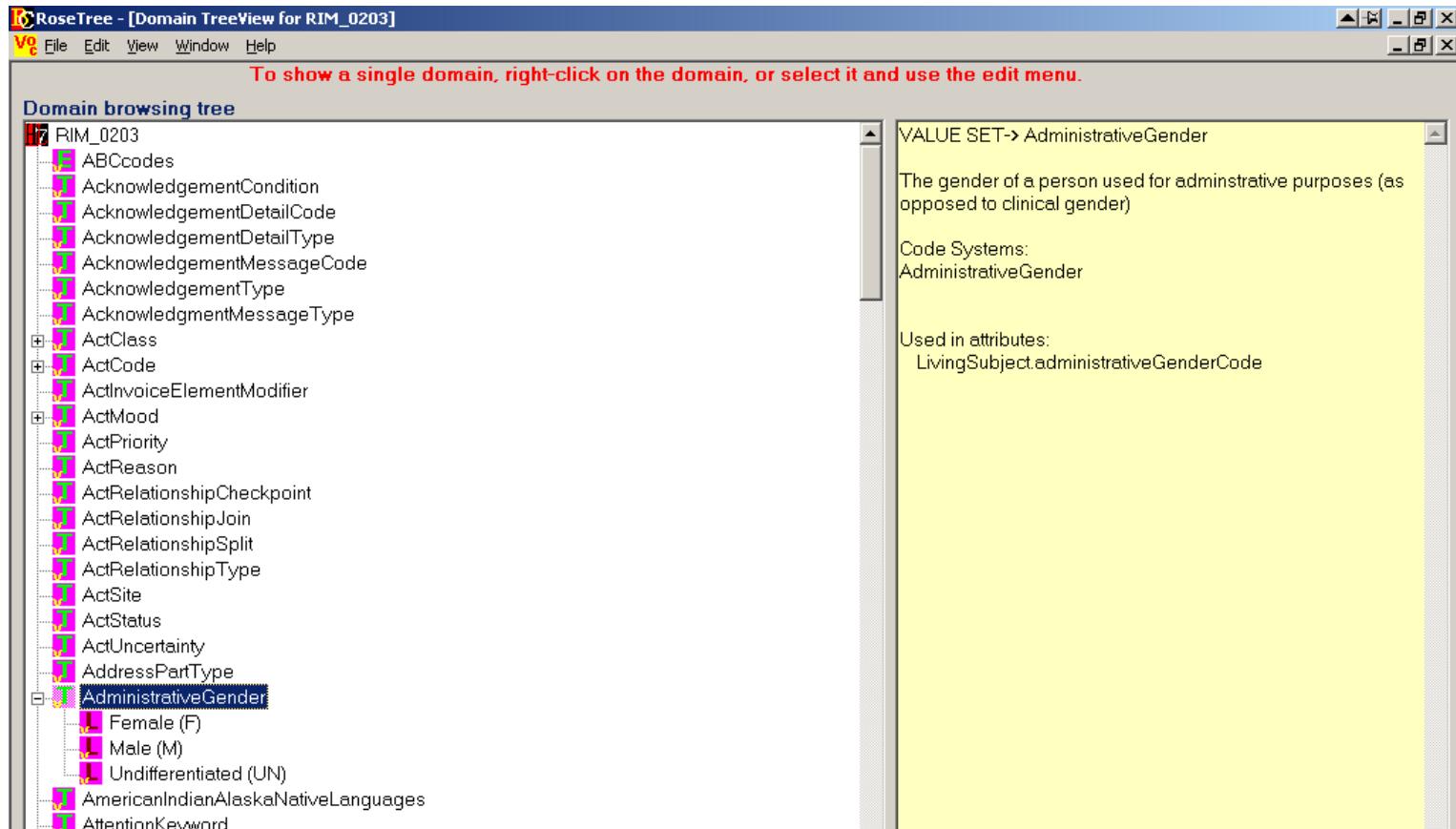
HL7 RIM Core Class Attributes



HL7 Vocabulary

- **Consists of:**
 - **HL7 Core Attributes
(Information Model)**
 - **Secondary Attribute Codes**
 - **Patient Gender**
 - **Prescribed Drug**
 - **Dx**
 - **Lab test**
 - **...**

HL7 Vocabulary (RoseTree Demo)



RoseTree - [Domain TreeView for RIM_0203]

File Edit View Window Help

To show a single domain, right-click on the domain, or select it and use the edit menu.

Domain browsing tree

- [-] RIM_0203
 - [+] ABCcodes
 - [+] AcknowledgementCondition
 - [+] AcknowledgementDetailCode
 - [+] AcknowledgementDetailType
 - [+] AcknowledgementMessageCode
 - [+] AcknowledgementType
 - [+] AcknowledgmentMessageType
 - [+] ActClass
 - [+] ActCode
 - [+] ActInvoiceElementModifier
 - [+] ActMood
 - [+] ActPriority
 - [+] ActReason
 - [+] ActRelationshipCheckpoint
 - [+] ActRelationshipJoin
 - [+] ActRelationshipSplit
 - [+] ActRelationshipType
 - [+] ActSite
 - [+] ActStatus
 - [+] ActUncertainty
 - [+] AddressPartType
 - [+] AdministrativeGender
 - [+] Female (F)
 - [+] Male (M)
 - [+] Undifferentiated (UN)
 - [+] AmericanIndianAlaskaNativeLanguages
 - [+] AttentionKeyword

VALUE SET-> AdministrativeGender

The gender of a person used for administrative purposes (as opposed to clinical gender)

Code Systems:
AdministrativeGender

Used in attributes:
LivingSubject.administrativeGenderCode

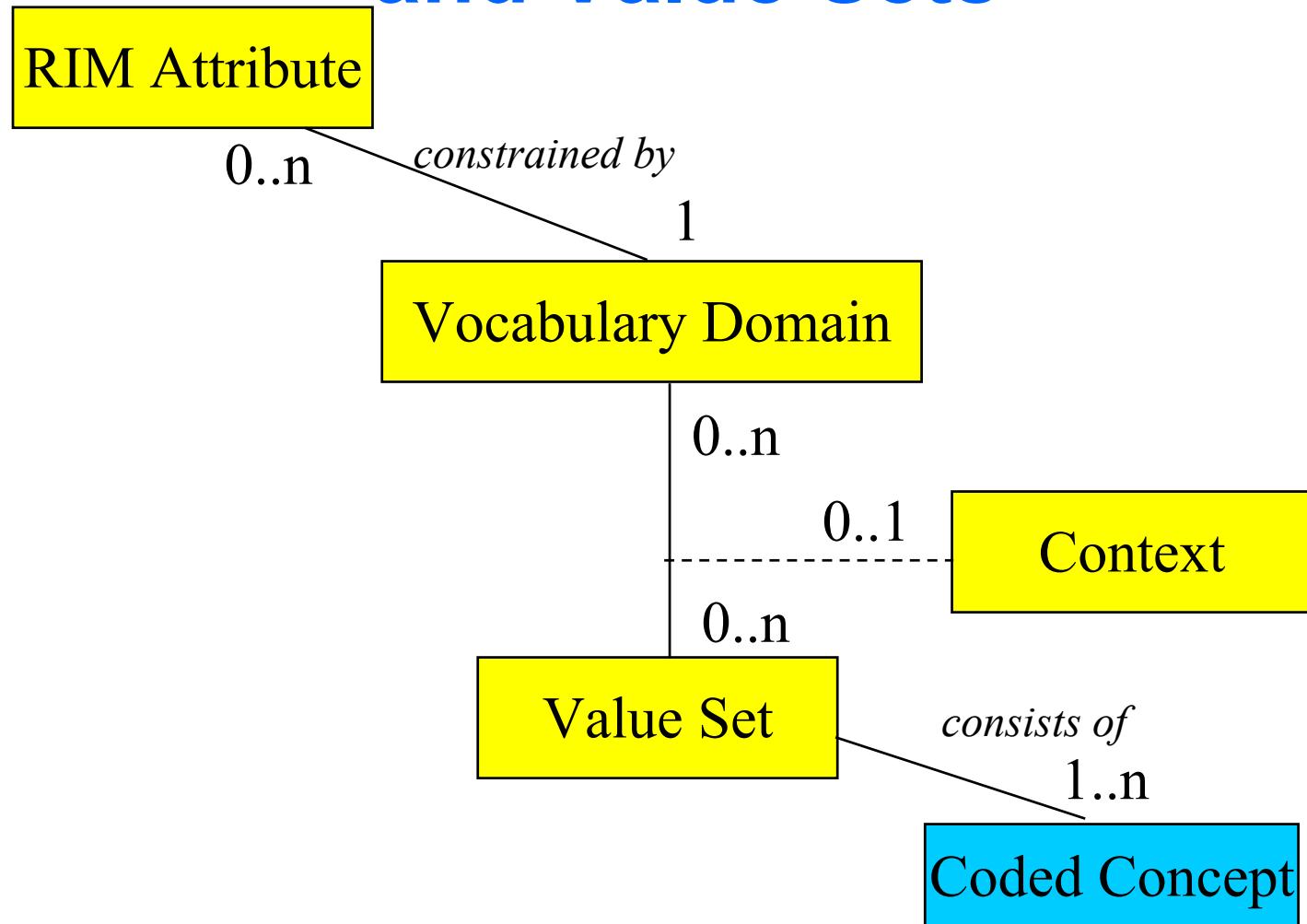
HL7 Vocabulary Philosophy

- HL7 is **NOT** a terminology developer
 - Use external terminology whenever possible
 - Create / augment only when necessary
 - Terminology not available
 - Available but prohibitive cost
 - Incomplete
 - Small and/or Version 2 compatible tables
 - Patient gender
 - Marital Status
 - ...

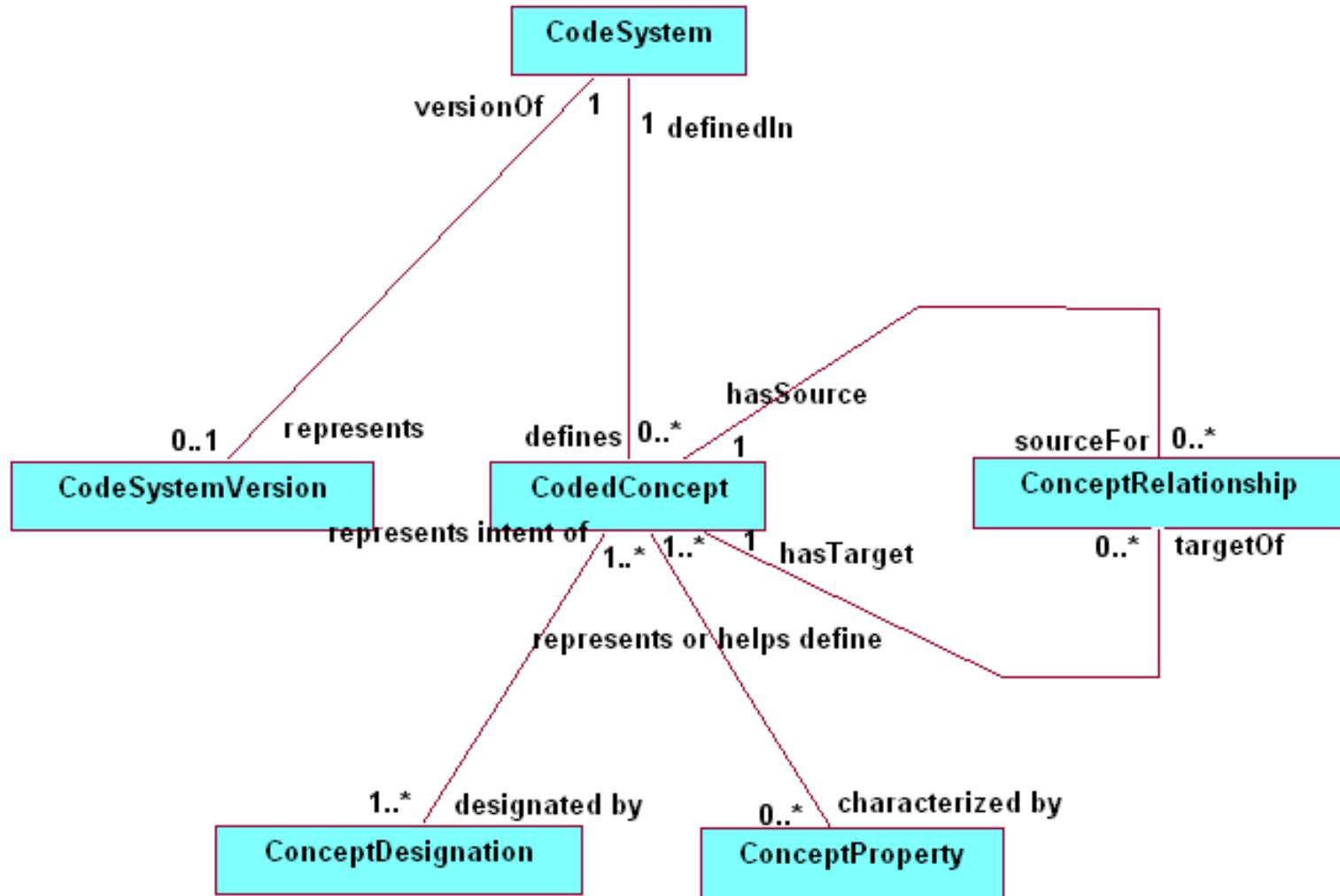
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Vocabulary Model

Attributes, Vocabulary Domains and Value Sets



Code Systems





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Common Terminology Services

Common Terminology Services (CTS)

- Purpose is to specify a common Application Programming Interface (API) to access terminological content
- Client software doesn't have to know about specific terminology data structures and/or how to access them
- Server software can plug and play with many clients

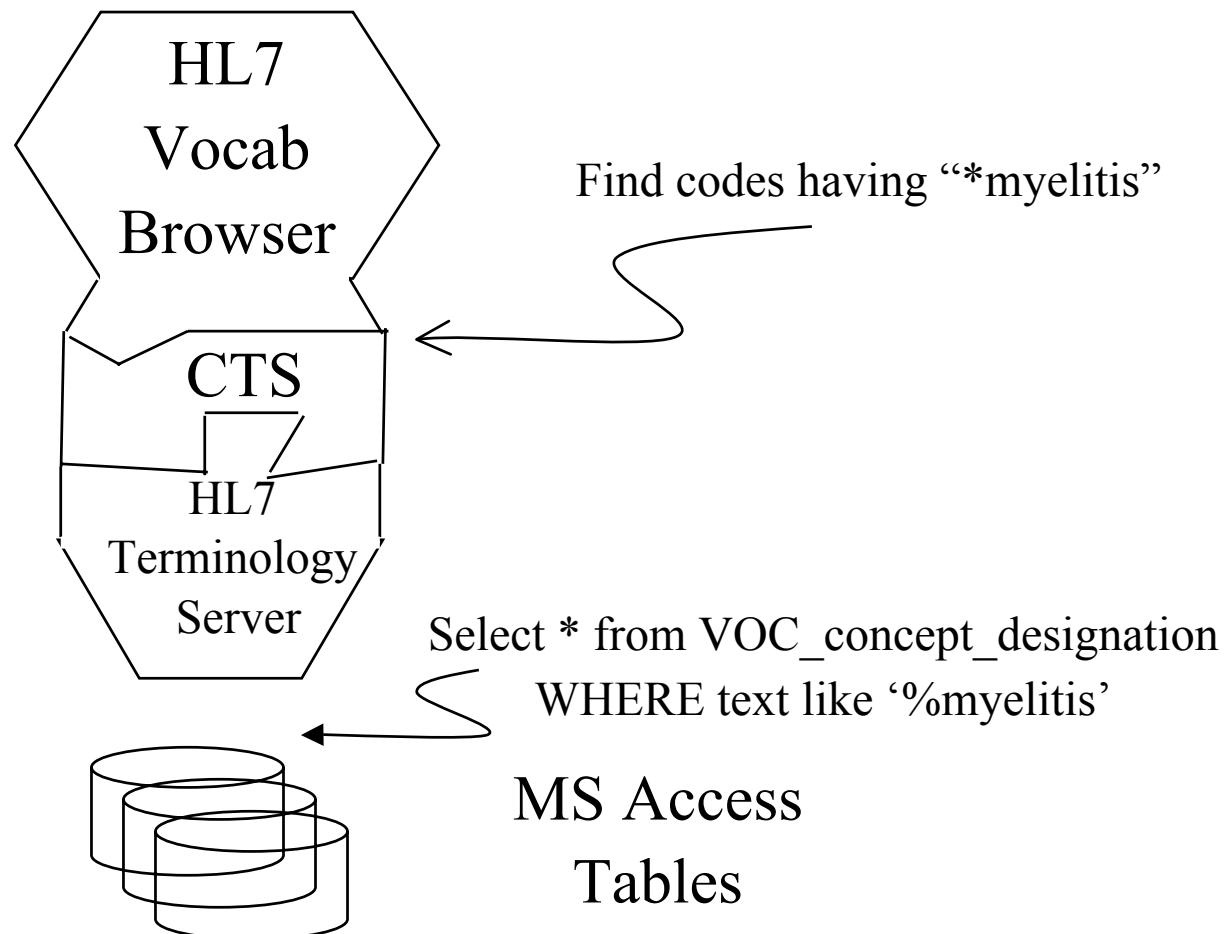
CTS API

Application

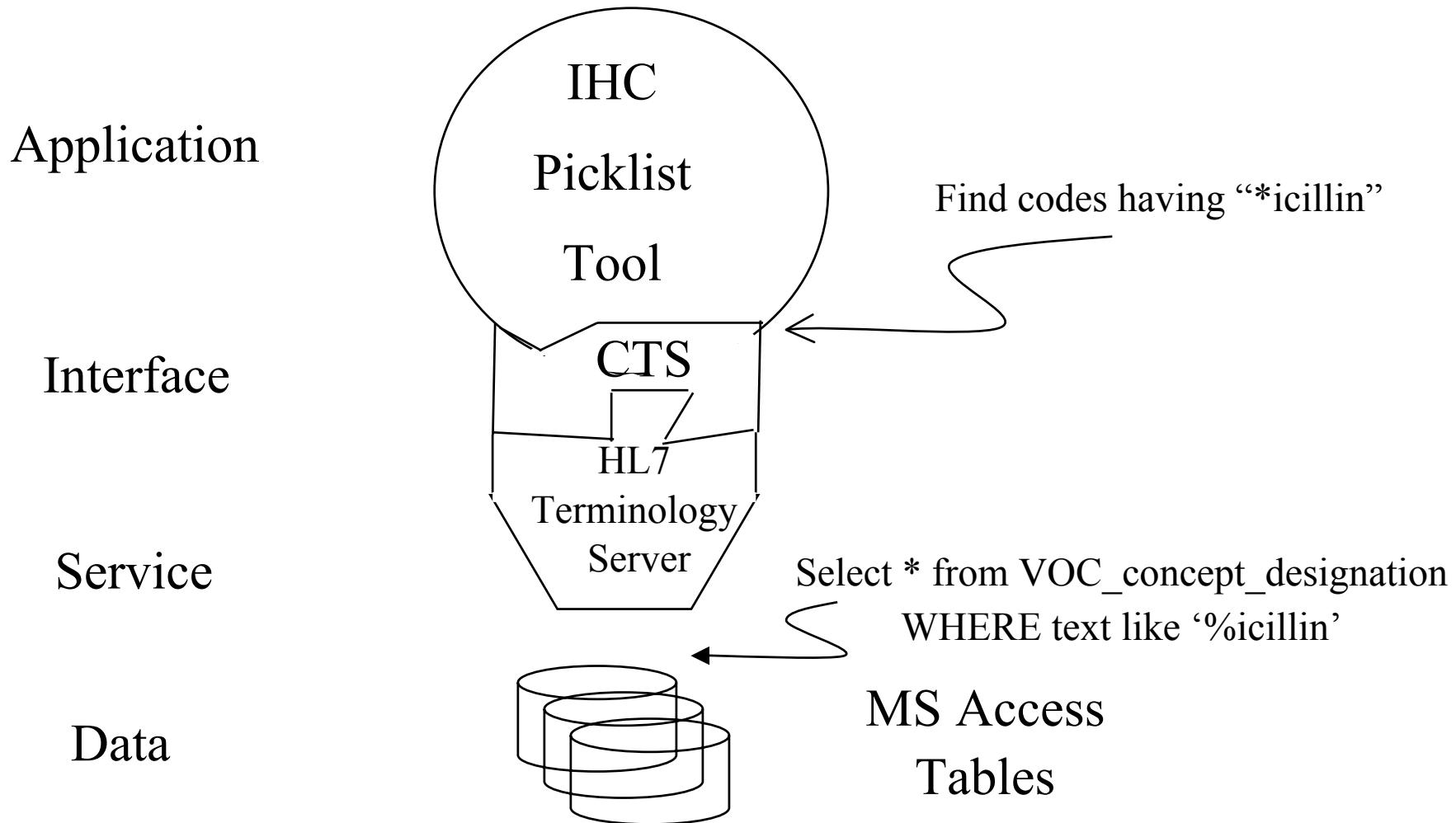
Interface

Service

Data



CTS API – Different Client, Same Service



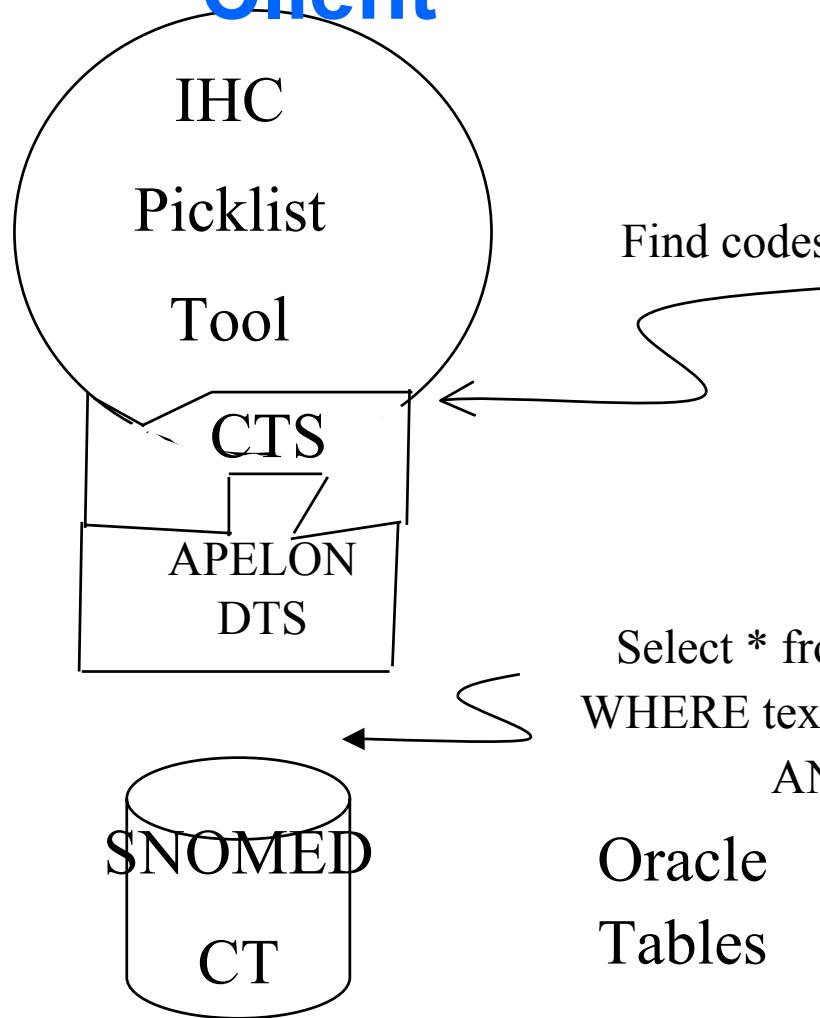
CTS API – Different Server, Same Client

Application

Interface

Service

Data



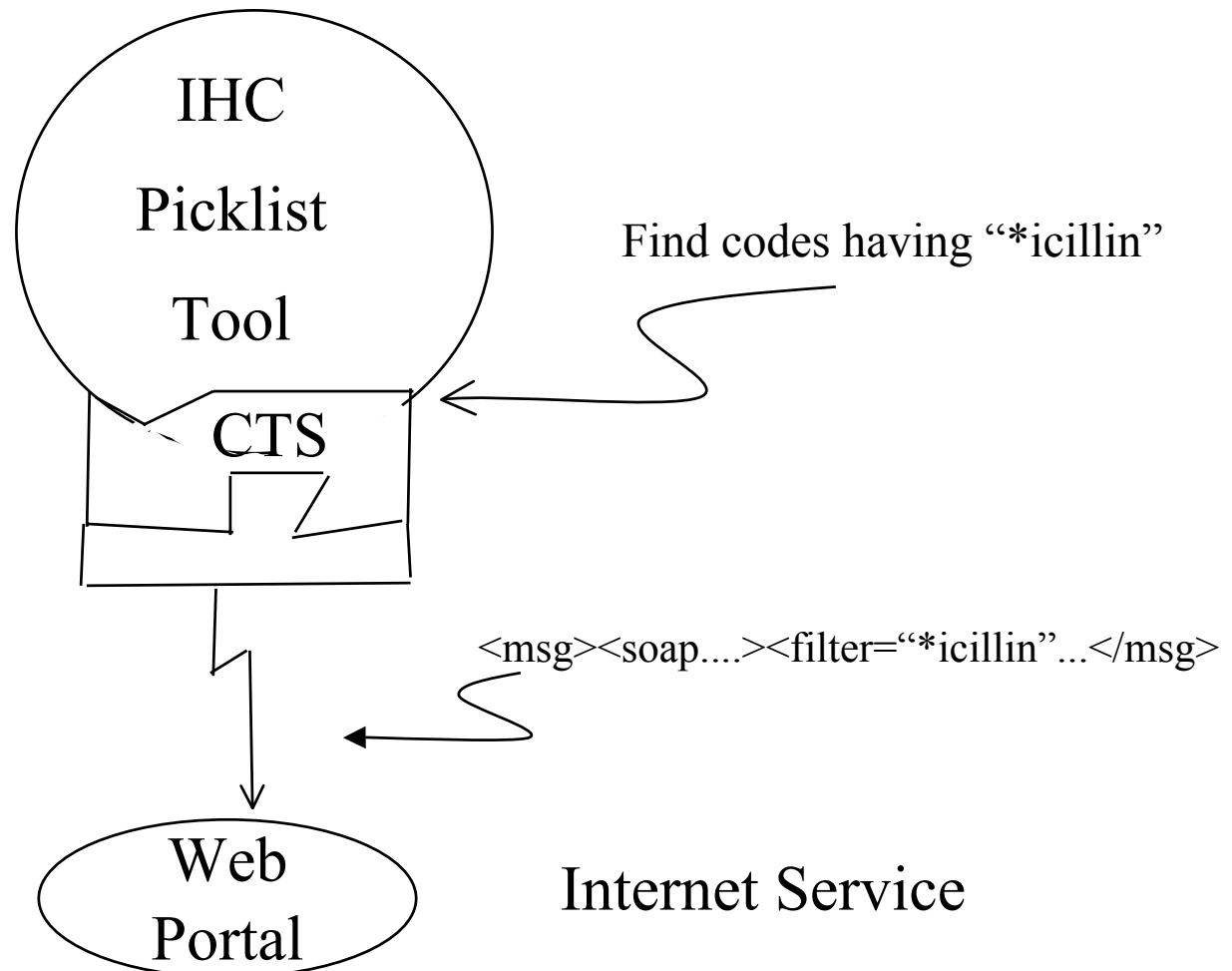
CTS API – Distributed Services

Application

Interface

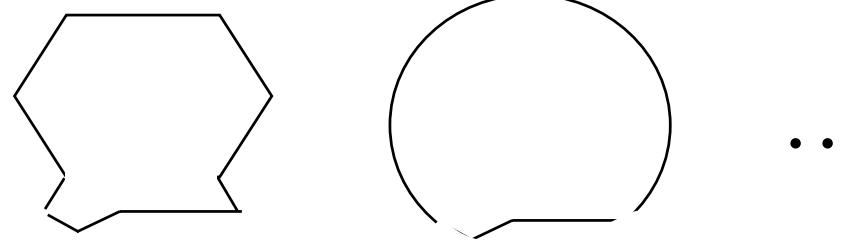
Service

Data



CTS API

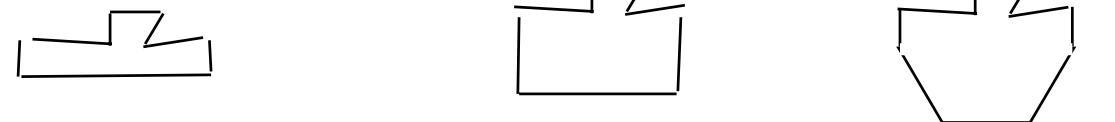
Application



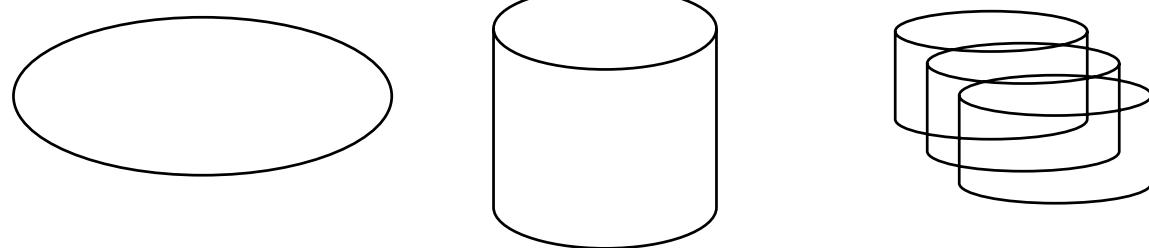
Interface



Service



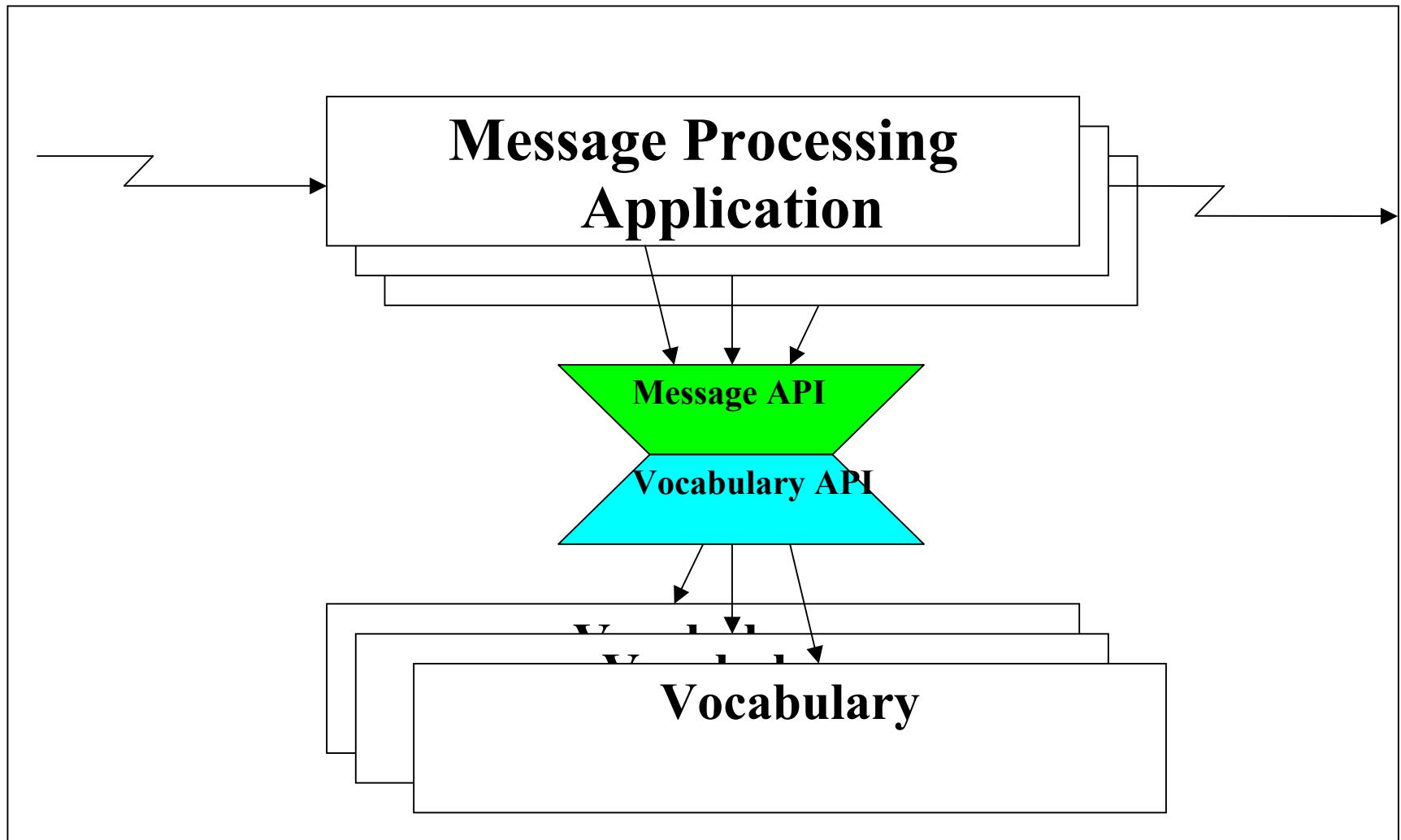
Data



Common Terminology Services API

- Allows Client Software to be Developed Independently from Service Server Software
- Allows Terminology Plug-and-Play
- Allows Client Plug-and-Play
- Defines a “Functional Contract”

Common Terminology Services



Common Terminology Services

- Services Are Also Partitioned by Function

	Runtime	Browser
Message API	Message Runtime	Message Browser
Vocabulary API	Vocabulary Runtime	Vocabulary Browser
Mapping Translation	/	Vocabulary Mapping

CTS Runtime Message API Examples

Function	Inputs	Output	Description
validateCode	Vocabulary domain name Coded attribute value Context	List of warnings and errors	Determine whether the supplied coded attribute (CD) is valid in this vocabulary domain and context.
validateTranslation	Vocabulary domain name Coded attribute value Context	List of warnings and errors	Determines whether the translation portion of the coded attribute is valid in this domain and context.
translateCode	Vocabulary domain name Coded attribute value Target code system Target context	Translated the supplied coded attribute	Translate the input code into a form that is valid in the target contexts.

CTS Runtime Message API (*continued*)

Function	Inputs	Output	Description
fillInDetails	Coded Attribute value Language code	Filled in coded attribute	Fill in the details for the coded attribute, including all code system names, versions and display names.
subsumes	Parent attribute value Child attribute value	True / False	Determine whether the parent attribute subsumes the child.
areEquivalent	Coded attribute value 1 Coded attribute value 2	True / False	Determine whether attribute value 1 and 2 are logically equivalent
lookupValueSetExpansion	Vocabulary domain name Context language	Hierarchical expansion of value set	Return a hierarchical list of selectable concepts for the vocabulary domain and context

CTS Runtime Vocabulary API

Function	Inputs	Output	Description
lookupCodeSystemInfo	Code system id –or– Code system name	Detailed information about the code system	Return detailed information about the named code system
isConceptIdValid	Code System id Concept Code	True / False	Determine whether the concept code is valid in the code system.
lookupDesignation	Code system id source concept code target concept code relationship code	True / False	Determine whether the relationship exists between the source and target code

CTS Runtime Message API (*continued*)

Function	Inputs	Output	Description
fillInDetails	Coded Attribute value Language code	Filled in coded attribute	Fill in the details for the coded attribute, including all code system names, versions and display names.
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Additional CTS API's

- **CTS Message Browsing API**
 - Used by HL7 Modelers
- **CTS Vocabulary Browsing API**
 - Used by HL7 Terminology Authors and Value Set Building
- **CTS Mapping API**
 - Used to translate concept codes from one system to another

Details can be found on HL7 Ballot spec

Common Terminology Systems

- **Interface specification**
 - Different message processing applications, same functions
 - Different terminology structures, philosophy – same behavior
- **Language Bindings**
 - (Currently) specified in OMG IDL
 - Java interface binding
 - Java bean binding
 - WSDL/SOAP binding
- **Specification is still under development...**

Links

<http://www.hl7.org/>

<http://informatics.mayo.edu/>

Standards / CTS

Implementation / CTS

Acknowledgements

**Special thanks to Abdul-Malik Shakir
of Shakir Consulting, who graciously
allowed us to use several of his HL7
overview slides**